

Listing of Claims

The following listing of claims replaces all previous versions and listings of claims. Please note that claims 29, 56, 59, 60, 69 and 74 are being cancelled. Claims 20, 50, 51, 52 and 70 are being amended. Claims 75-79 are being added.

1-19. Cancelled

20. (Currently Amended) A process for forming layers in electronic devices comprising the steps of:

providing a reaction chamber, the reaction chamber comprising a cold wall chamber;

placing a semiconductor wafer in said reaction chamber;

heating said semiconductor wafer with a thermal heating device placed adjacent to said wafer to a temperature of at least about 300°C.;

pulsing a precursor fluid into said reaction chamber, said precursor fluid forming a solid layer on said semiconductor wafer;

~~thereafter exposing said solid layer to light energy in said reaction chamber; and~~

~~wherein between each pulse of said precursor fluid, (i) said reaction chamber is purged by flowing an inert gas through said reaction chamber in order to substantially remove any said precursor fluid not converted into a solid; and (ii) said solid layer is exposed to said light energy;~~

purging said reaction chamber by flowing an inert gas through said reaction chamber after each pulse in order to substantially remove any of said precursor fluid not converted into a solid; and

annealing the solid layer multiple times after certain pulses of the precursor fluid, the solid layer being annealed by exposing the solid layer to thermal light energy.

21. (Original) A process as defined in claim 20, wherein said precursor fluid comprises a gas.

22. (Original) A process as defined in claim 20, wherein said thermal heating device comprises an electrical resistance heater.

23. Cancelled

24. (Original) A process as defined in claim 20, further comprising the step of maintaining said reaction chamber at a pressure of less than about 760 torr when pulsing said precursor fluid into said reaction chamber.

25. (Original) A process as defined in claim 20, further comprising the step of maintaining said reaction chamber at a pressure of less than about 3 torr when pulsing said precursor fluid into said reaction chamber.

26-28. Cancelled

29. Cancelled.

30. (Original) A process as defined in claim 20, further comprising the step of maintaining said reaction chamber at a pressure of from about 10^{-2} torr to about 10^{-7} torr when pulsing said precursor fluid into said reaction chamber.

31-49. Cancelled.

50. (Currently Amended) A process for forming layers in electronic devices comprising the steps of:

providing a reaction chamber;

placing a semiconductor wafer in said reaction chamber;

heating said semiconductor wafer with a thermal heating device placed adjacent to said wafer;

pulsing a precursor fluid into said reaction chamber, said precursor fluid forming a solid layer on said semiconductor wafer, wherein said solid layer is a material selected from the group consisting of tungsten, tungsten nitride, tantalum nitride, titanium nitride, copper, aluminum, ruthenium oxide, iridium oxide, and silver;

~~thereafter exposing said solid layer to light energy in said reaction chamber;~~

~~wherein said precursor fluid is substantially exhausted and removed from said reaction chamber and said solid layer is exposed to said light energy in between each pulse of said precursor fluid~~

purging said reaction chamber by flowing an inert gas through said reaction chamber after each pulse in order to substantially remove any of said precursor fluid not converted into a solid; and

annealing the solid layer multiple times after certain pulses of the precursor fluid, the solid layer being annealed by exposing the solid layer to thermal light energy.

51. (Currently Amended) A process for forming layers in electronic devices comprising the steps of:

providing a reaction chamber;

placing a semiconductor wafer in said reaction chamber;

heating said semiconductor wafer with a thermal heating device placed adjacent to said wafer;

pulsing a precursor fluid into said reaction chamber, said precursor fluid forming a solid layer on said semiconductor wafer, wherein said solid layer comprises a material selected from the group consisting of zirconium oxide, aluminum oxide, barium strontium titanate and a silicate; and

~~thereafter exposing said solid layer to light energy in said reaction chamber;~~

~~wherein said precursor fluid is substantially exhausted and removed from said reaction chamber and said solid layer is exposed to said light energy in between each pulse of said precursor fluid~~

purging said reaction chamber by flowing an inert gas through said reaction chamber after each pulse in order to substantially remove any of said precursor fluid not converted into a solid; and

annealing the solid layer multiple times after certain pulses of the precursor fluid, the solid layer being annealed by exposing the solid layer to thermal light energy.

52. (Currently Amended) A process for forming layers in electronic devices comprising the steps of:

providing a reaction chamber, the reaction chamber comprising a cold wall chamber;

placing a substrate in said reaction chamber;

pulsing a precursor fluid into said reaction chamber;

exposing said precursor fluid to thermal light energy in said reaction chamber simultaneous with each pulse of the precursor fluid, the light energy causing said precursor fluid to convert into a solid layer on said substrate; and

after each pulse of the precursor fluid, decreasing the amount of thermal light energy and purging the reaction chamber by flowing an inert gas through the reaction chamber, the inert gas cooling the solid layer and substantially removing any of the precursor fluid not converted into a solid.

~~wherein said precursor fluid is substantially exhausted and removed from the reaction chamber in between each pulse of the precursor fluid.~~

53. (Previously Added) A process as defined in claim 52, wherein said precursor fluid comprises a liquid vapor.

54. (Previously Added) A process as defined in claim 52, wherein said precursor fluid comprises a gas.

55. (Previously Added) A process as defined in claim 52, wherein said substrate comprises a semiconductor wafer.

56. Cancelled.

57. (Previously Added) A process as defined in claim 52, wherein said light energy is supplied by light energy sources positioned outside said reaction chamber.

58. (Previously Added) A process as defined in claim 52, further comprising the step of maintaining said reaction chamber at less than atmospheric pressure when pulsing said precursor fluid into said reaction chamber.

59. Cancelled.

60. Cancelled.

61. (Previously Added) A process as defined in claim 52, wherein said solid layer comprises a dielectric material.

62. (Previously Added) A process as defined in claim 52, wherein said solid layer comprises a conductive material.

63. (Previously Added) A process as defined in claim 52, wherein said solid layer comprises zirconium oxide.

64. (Previously Added) A process as defined in claim 52, wherein said precursor fluid comprises a hydride.

65. (Previously Added) A process as defined in claim 52, wherein said solid layer comprises a material selected from the group consisting of tungsten, tungsten nitride, tantalum nitride, titanium nitride, copper, aluminum, ruthenium oxide, iridium oxide, and silver.

66. (Previously Added) A process as defined in claim 52, wherein said solid layer comprises a material selected from the group consisting of zirconium oxide, aluminum oxide, a nitride, barium strontium titanate and a silicate.

67. (Previously Added) A process as defined in claim 52, wherein said solid layer comprises zirconium hafnium oxide.

68. (Previously Added) A process as defined in claim 52, further comprising the step of maintaining said reaction chamber at a pressure of less than about 5 torr when pulsing said precursor fluid into said reaction chamber.

69. Cancelled.

70. (Currently Amended) A process as defined in claim 52, wherein the reaction chamber includes walls, the walls being made from an insulating [materials] material.

71. (Previously Added) A process as defined in claim 52, wherein the reaction chamber includes a cooling system for cooling the walls of the reaction chamber.

72. (Previously Added) A process as defined in claim 70, wherein the insulating material comprises quartz.

73. (Previously Added) A process as defined in claim 52, wherein between selected pulses of the precursor fluid, the solid layer being formed is annealed.

74. Cancelled.

75. (New) A process for forming layers in electronic devices comprising the steps of:

providing a reaction chamber, the reaction chamber comprising a cold wall chamber;

placing a substrate in said reaction chamber;

pulsing a precursor fluid into said reaction chamber;

exposing said precursor fluid to thermal light energy in said reaction chamber simultaneous with each pulse of the precursor fluid, the light energy causing said precursor fluid to convert into a solid layer on said substrate;

after each pulse of the precursor fluid, decreasing the amount of thermal light energy and purging the reaction chamber by flowing an inert gas through the reaction chamber, the inert gas cooling the solid layer and substantially removing any of the precursor fluid not converted into a solid; and

wherein between selected pulses of the precursor fluid and after cooling, annealing the solid layer by exposing the solid layer to thermal light energy prior to the next pulse.

76. (New) A process as defined in claim 75, further comprising the step of maintaining said reaction chamber at a pressure of less than about 5 torr when pulsing said precursor fluid into said reaction chamber.

77. (New) A process as defined in claim 75, wherein the reaction chamber includes walls, the walls being made from an insulating material.

78. (New) A process as defined in claim 75, wherein the reaction chamber includes a cooling system for cooling the walls of the reaction chamber.

79. (New) A process as defined in claim 75, wherein the solid layer is annealed after each pulse of the precursor fluid.